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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/069,868	08/07/2002	Masahiro Saito	740675-41	5691

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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/069,868	SAITO ET AL.	
	Examiner	**Art Unit**	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-9* is/are pending in the application.

4a) Of the above claim(s) ____ is/are withdrawn from consideration.

5)☐ Claim(s) ____ is/are allowed.

6)☒ Claim(s) *1 and 3-9* is/are rejected.

7)☐ Claim(s) ____ is/are objected to.

8)☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 August 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11-24-2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: ____.

Detailed Action

1. This Office Action is submitted in response to Amendment dated 8-18-2004, wherein claim 2 is cancelled and claims 1, and 3-9 have been amended. Claims 1, and 3-9 are pending.

Claims Rejection – 35 U.S.C. 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,455,879 to Modavis.

Modavis (879) discloses in FIG. 1 an optical fiber 10, an end 13 of which is positioned in light receiving relationship with respect to laser diode 15. Fiber 10 has a circularly symmetrical core 11, and a cladding 12. End 13 is provided with anamorphic lens means 16 to facilitate the capture of light by core 11 and to direct away from the laser facet any light that reflects from the fiber endface. Anamorphic lens means 16,

which is formed integrally with fiber 10, may be located about 3-6 μ from the laser diode.

FIGS. 2 and 3 show an embodiment in which lens means 16 consists of a wedge-shaped fiber microlens 21 on one end of fiber 10. The microlens includes a first pair of surfaces 22 and 23 that intersect at a line 24 that substantially bisects core 11. The microlens further includes surfaces 25 and 26 (2^{nd} inclined surfaces) that intersect surfaces 22 and 23, respectively, at lines 27 and 28, respectively. The slopes of surfaces 22 and 23 are θ and the slopes of surfaces 25 and 26 are Φ, wherein Φ is greater than θ. The angles θ and Φ are measured with respect to a plane 29 perpendicular to fiber axis 30. Lines 27 and 28 of intersection of the first and second pairs of surfaces preferably intersect the core as shown in FIG. 3. Moreover, the area of surface 22 is preferably substantially equal to the area of surface 23. In other words, the central portion of lens 21 is preferably symmetrical about a plane containing axis 27 and line 24.

A fiber was formed having a double wedge lens wherein wedge angles θ and Φ were 15° and 44°, respectively. The "break point" (the region where the wedge angle changes) occurred within the core region 11 of fiber 10. That is, lines 27 and 28

intersected core 11. See Column 3, line 32-62; and Figures 2 and 3 below.

FIG. 2

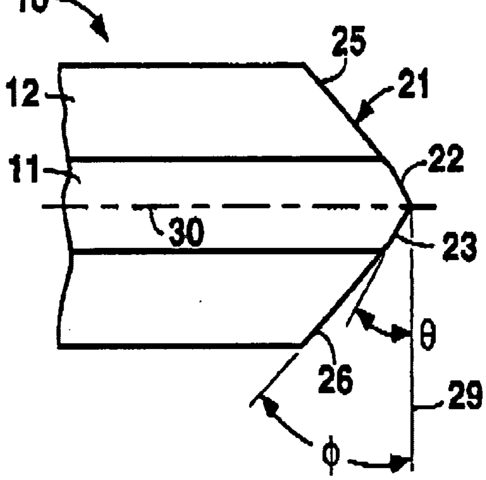
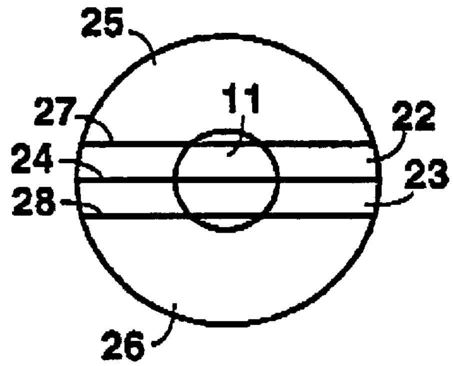


FIG. 3



Modavis (879) also discloses the anamorphic lens design illustrated in FIGS. 8 and 9 is easier to fabricate than the above described multiple angle lenses and has a coupling efficiency that can be larger than the efficiency of those lenses. This design consists of an optical fiber 51 having a cladding 53 and a core 52, the cross-section of the core in a plane perpendicular to the longitudinal fiber axis is an ellipse having a major and a minor axis. The end of the fiber is ground to form a wedge shaped microlens 54 that includes a surfaces 55 and 56 that intersect at a line 57 that lies on the major axis of the ellipse, i.e. line 57 substantially bisects the fiber core. See Column 5, line 10-20; and Figures 8 and 9 below.

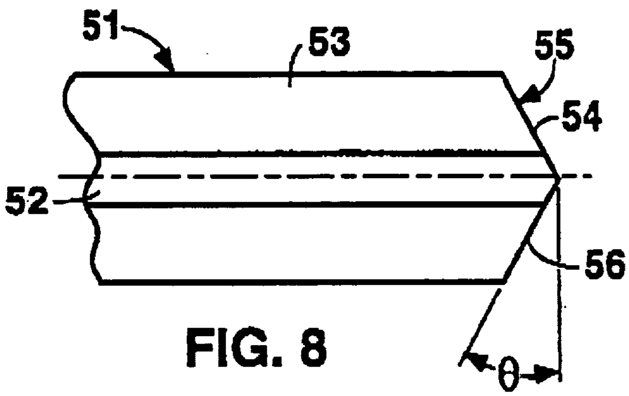


FIG. 8

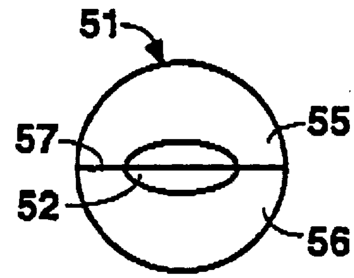


FIG. 9

Modavis (879) further discloses in FIG. 10, a system for coupling light from laser diode 72 to circularly symmetric single-mode field fiber 74. Source 72 emits a beam of light having an elliptical cross-section, the cross-section of the beam in a plane perpendicular to the beam axis being an ellipse having a major and a minor axis. The elliptical mode fiber (and thus the wedge-shaped microlens) is oriented with respect to the source such that light from source 72 is efficiently coupled to elliptical core fiber 51. Light propagating in elliptical mode fiber 73 can be efficiently coupled to circularly symmetric single-mode fiber 74. see Column 5, line 29-39.

It is implied herein that orienting the fiber with respect to the beam of light for efficiently coupling the fiber to the light beam in accordance with Modavis (879) above,

is equivalent to "rotating the fiber axis to match the direction of travel of the centerline of the light beam", as recited in Claim 9.

Modavis (879) as applied above discloses the claimed invention except for the ratio of the curvature radii of the arcs being between 1.2 and 3.8; 1.8 and 2.4; 1.3 and 2.6; 1.6 and 1.9, as recited in Claims 5-8. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to grind the end of the fiber at various angles (curvature radii), to change the shape of the resultant ellipse's major and minor axes while attempting to maximize coupling efficiency, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Examiners Response to Arguments

4. Applicant's arguments filed 8-18-2004 have been fully considered but they are not persuasive.

Argument 1.

Applicant states that "That is, independent claim 1 recites an optical fber microlens that has a core and a cladding end at the tip and an anamorphic means of conversion, in which at the optical fiber tip that faces the light source or radiated beam a first pair of incline surfaces are formed in a positional relationship such that they

intersect in a wedge shape, on the axis of a plane perpendicular to the axis of the optical fber along the center of the core are formed second inclined surfaces and at an angle to a plane perpendicular to the central axis of the optical fiber and lengthwise to the wedge shaped tip and wherein the tip of the optical fiber microlens is process as a curved surface, in which the curved surface is a portion of an elliptical surface, and one major axis of the elliptical surface matches the central axis of the core. Clearly, the Modavis et al. reference fails to disclose or suggest such features.

Similarly, independent claim 3 recites an optical fiber microlens similar to that of independent claim 1 with the tip of the optical fiber microlens being processed as a curved surface in which the inner section of the curved surface with each of two perpendicular planes that contain the central axis of the core is an arc each with a specified radius. Again, the patent to Modavis et al. neither discloses nor remotely suggests that which is presently set forth in independent claim 3."

The applicant is respectfully directed to Modavis (879), Column 4, line 35-46, which states; In the anamorphic lens design of FIGS. 5, 6 and 7, lens means 16 consists of a quasi cone-shaped lens wherein the cone angle changes from θ_1 to θ_2 as the as the azimuthal angle ρ changes from 0° to 90°. The cone angle changes back from θ_2 to θ_1 as the azimuthal angle ρ is changed from 90° to 180°. A similar cone angle change occurs at values of azimuthal angle ρ between 180° and 360°. **The change in cone angle can be linear or non-linear with respect to the azimuthal angle.** Lens 41 differs from typical cone-shaped rotationally symmetric fiber lenses wherein the cone angle θ is the same for all azimuthal angles.

Also Figures 5,6, and 7 below, which show;

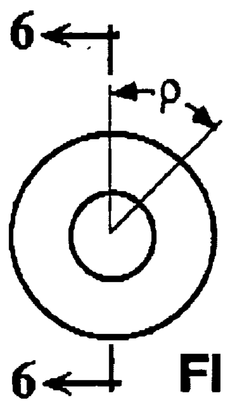


FIG. 5

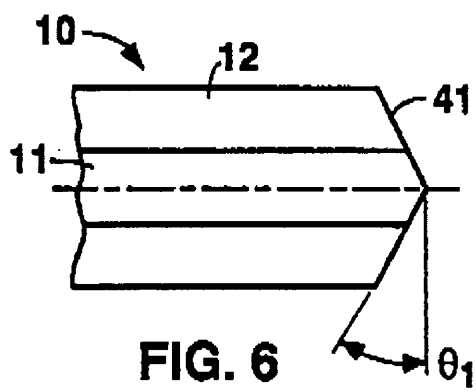


FIG. 6

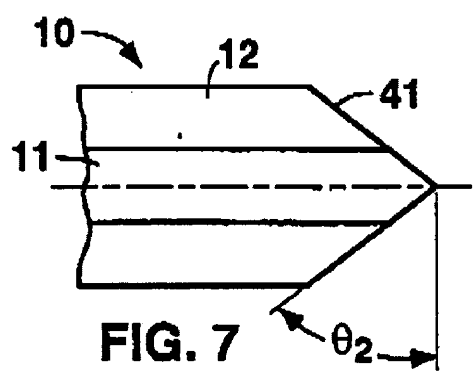


FIG. 7

Also Column 5, line 10-29, which states;

The anamorphic lens design illustrated in FIGS. 8 and 9 is easier to fabricate than the above described multiple angle lenses and has a coupling efficiency that can be larger than the efficiency of those lenses. This design consists of an optical fiber

51 having a cladding 53 and a core 52, the cross-section of the core in a plane perpendicular to the longitudinal fiber axis is an ellipse having a major and a minor axis. The end of the fiber is ground to form a wedge shaped microlens 54 that includes a surfaces 55 and 56 that intersect at a line 57 that lies on the major axis of the ellipse, i.e. line 57 substantially bisects the fiber core.

The calculated coupling efficiency for a 25°wedge on an elliptical core fiber having a 2.14x1.59 μm mode field is 93.5% (excluding coupling loss). The elliptical core single wedge lens design has a better coupling efficiency than a single wedge lens on a 2.0 μm circular mode field fiber, the coupling efficiency of which is 89.2% (excluding coupling loss). The coupling efficiency of the single wedge-elliptical core fiber could be increased even more by choosing a fiber having a mode field of higher ellipticity.

The examiner has interpreted from the Modavis (879) references above that an elliptically shaped anamorphic lens is formed having inclined surfaces that intersect in a wedge shape, and the tip is further formed into curved surfaces by grinding the surfaces non-linearly (curved) with respect to the azimuthal angle $\boldsymbol{\rho}$, equivalent to the tips formed, as recited in claims 1 and 3.

Argument 2.

Applicant states that "With respect to independent claim 9, this claim recites a method of positioning an optical fiber microlens such that when the light beam that enters from a given light source forms an elliptical flat shape on the plane that is in

contact with the tip of the optical fiber microlens, the optical fiber is positioned by rotating the axis so that the central axis of the core matches the direction of travel of the center line of the light beam and a line tangent to the largest curvature in the core tip is perpendicular to the long direction of the elliptical flat shape. As the Exanminer can appreciate from Fig. 10 of the Modavis et al. reference, this reference discloses that the mode field shape is modified from ellipse to a circle in the ellipse fiber core to use a coupling, and introduces a standard circle fiber core by special melting splice. Clearly, the Modavis et al. reference neither discloses nor remotely suggests that which is presently set forth in the method set forth in independent claim 9."

The applicant is respectfully directed to Modavis (879), Figure 10 below; Column 5, line 10-20; and Column 5, line 30-39, which state; The anamorphic lens design illustrated in FIGS. 8 and 9 is easier to fabricate than the above described multiple angle lenses and has a coupling efficiency that can be larger than the efficiency of those lenses. This design consists of an optical fiber 51 having a cladding 53 and a core 52, the cross-section of the core in a plane perpendicular to the longitudinal fiber axis is an ellipse having a major and a minor axis. The end of the fiber is ground to form a wedge shaped microlens 54 that includes a surfaces 55 and 56 that intersect at a line 57 that lies on the major axis of the ellipse, i.e. line 57 substantially bisects the fiber core.

FIG. 10 schematically illustrates a system for coupling light from laser diode 72 to circularly symmetric single-mode field fiber 74. Source 72 emits a beam of light having an elliptical cross-section, the cross-section of the beam in a plane perpendicular to the beam axis being an ellipse having a major and a minor axis. The

elliptical mode fiber (and thus the wedge-shaped microlens) is oriented with respect to the source such that light from source 72 is efficiently coupled to elliptical core fiber 51. Light propagating in elliptical mode fiber 73 can be efficiently coupled to circularly symmetric single-mode fiber 74.

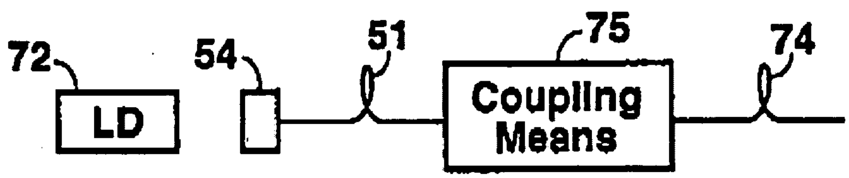


FIG. 10

The examiner has interpreted from the Modavis (879) references above, that the elliptical shaped microlens 54 is first oriented with the shape of the elliptical shape of the laser beam to maximize their coupling efficiency, in a manner equivalent to that recited in claim 9. The system is then used to further couple fiber 51(including microlens 54) to fiber 74, a conventional circularly symmetrical fiber.

Conclusion

5. The Amendment filed on 8-18-2004 under 37 CFR 1.131 has been considered but is ineffective to overcome the Modavis (879) references.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
November 24, 2004

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800